

# The Effect of 8 Weeks of High Intensity Periodic and Medium Intensity Continuous Training on Troponin I Levels in Obese Students

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## ABSTRACT

**Background and Aim:** Obesity is one of the most important risk factors that eventually lead to lipid disorders. It seems that regular exercise and physical activity along with proper nutrition can mitigate these risk factors. The purpose of this study was to investigate the effect of 8 weeks of high intensity Periodic and moderate intensity continuous training on troponin I levels in obese male students. **Methods:** This is a quasi-experimental and applied research. In the present study, the statistical population consisted of all obese male students (BMI >30) of Zahedan city with a range of 19 to 26 years. In the present study, the sample size according to similar studies was considered 45 subjects in 3 groups, high intensity interval training (15 N), moderate intensity continuous training (15 N) and control group (15 N). Intermittent and continuous training groups performed three sessions of training for 8 weeks and three sessions each week. Intermittent training with 55-90% of maximal heart rate and moderate training consisted of 40 minutes of running with 40-75% of maximal heart rate. Anthropometric indices and baseline values of the studied factors were measured 24 hours before the first and then 48 hours after the last training session by Zahedan Etemad laboratory experts. Descriptive statistics such as mean and standard deviation were used to describe the data. To test the research hypotheses after making sure that the data were normalized using Kolmogorov-Smirnov test, dependent t-test was used to test for intra-group changes and One-way ANOVA and Tukey post hoc tests for inter-group changes. Statistical analysis was performed at the significant level ( $P \leq 0.05$ ) by SPSS 20 software. **Results:** The results of the hypotheses analysis showed that the response of 8 weeks of moderate intensity training on plasma levels of troponin I was significantly different from the control group. There was also a significant difference between the response of 8 weeks of high intensity intermittent training on plasma levels of troponin I compared to the control group and also 8 weeks of high intensity intermittent training response to plasma levels of troponin I in comparison with the continuous training group. shows. Also, pre-test and post-test changes in plasma levels of troponin I were significant in the high intensity and medium intensity continuous training groups. **Conclusion:** The results of the present study showed that high-intensity and moderate-intensity intermittent training on plasma levels of troponin I was significantly different from pre-exercise levels. Therefore, both methods of training have positive and significant effects on improving aerobic power. Based on the characteristics of the subjects such as age, sex, physical health status, etc., different types of aerobic exercises with different intensities can be used to improve the existing condition.

## 1. Introduction

Obesity is one of the most serious problems that is spreading and its growing makes concern. It happens when the balance between energy intake and energy consumption is disrupted and because physical activity is directly related to energy consumption, obesity can be directly linked to decreased activity levels. In this regard, exercise and physical activity is one of the methods of prevention and treatment of obesity. However, specialists are always

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trying to identify new ways to prevent and treat obesity by studying the causes and causes of obesity, regulating energy and complex hormonal systems, nervous systems and receptors (Ross& Leveritt, 2001). It is noteworthy that in our country there is no accurate data on the prevalence of obesity in different classes, but in the United States, for example, statistics show that the proportion of people considered obese increased from 23% to 31% between 1988 and 1994. Is. If this trend continues, the numbers will increase, as is the case in European countries (Arabnejad et al, 2013). Obese patients are prone to physical, mental, and social disabilities; except for aesthetic problems with various diseases such as diabetes (high blood sugar), hypertension, hyperlipidemia, joint pain, respiratory and respiratory problems in sleep, articular degenerative diseases, increased urea Blood and pulmonary and cardiovascular diseases are accompanied by reports of cancer (uterus, breast, colon, gall bladder, ovary, colon and prostate), gall bladder, permeability, infertility, menstrual disorder, stress and forgetfulness; Gives about 20% of health care costs in many countries to obesity and unhealthy diseases Of it is devoted. Reports also suggest that in the US, 250,000 people die each year due to obesity and diseases. The role of obesity in a variety of diseases that has been the focus of attention in the world health system has led the World Health Organization to consider obesity one of the ten major risk factors for diseases that cause mortality. Health authorities in Iran have realized the importance of obesity and this has become a concern for them (Bickham& Le Rossignol, 2004). Nowadays, obesity and its diseases are one of the most common problems in different societies. Obesity is a multifaceted disease that involves multiple tissues and is primarily caused by an imbalance between energy intake and consumption. Therefore, identifying the positive effects of exercise on metabolism at both molecular and clinical levels has become a topic of interest for researchers. Although the benefits of appropriate training to improve and treat non-pharmacological metabolic and cardiovascular diseases have been well demonstrated, the mechanisms through which training exerts its positive effects are not well understood (Bishop et al, 2003). Troponin I is a marker of heart disease, a complex comprising three subunits of TnC, TnT, and TnI, all of which are located in the contractile networks of the striated muscles and do not exist freely in the bloodstream. All three are used as a specific marker of acute myocardial infarction, but Troponin I is more specific than the other two components. This subunit contains 31 additional amino acids in its N-terminal domain, which are absent in other isoforms, making it a specific marker of myocardial infarction (Bogdanis et al, 1996). Troponin I is an inhibitory subunit that regulates calcium-mediated reactions between actin and myosin. This marker normally has a concentration below 0.2 in the bloodstream but is released from the striated muscles of the heart if it attacks the heart and rises in blood. Troponin I concentrations begin to rise within the first 4-6 hours of a heart attack and peak within 10 to 24 hours and can be detected up to 10 days after a heart attack. This marker does not increase in conditions such as training or other musculoskeletal injuries and is therefore a reliable marker in the study of acute myocardial infarction (Burgomaster et al, 2008). Research on insurance company employees, and on 74,000 factory workers, found that obese people were 2.5 times more likely than normal people to have high blood pressure (Gibala et al, 2006). In most cases, in obese individuals, not only the heart is enlarged but also the problem (adipose) of the heart, in which case the amount of fat in the lower layers of the epicardium and between the muscle fibers increases (Bogdanis et al, 2007). A study by Allison on obesity found that mortality was higher in obese individuals (30-75%) than in normal subjects. People with obesity between 14% and 5% have a 22% higher mortality and those with obesity (15% to 24%) have a 44% higher mortality rate and those with a 25% and higher mortality rate have a 74% mortality rate. There are more deaths, and it is also concluded that the worsening consequences of obesity increase with age. People 45 to 50 years of age have a mortality rate of 8% higher than those who are obese, about 4.5 kg, and 18% obese if they have 9 kg of obesity, and 13.5 kg if obese 28 Percentage and eventually if they have 23 kg of obesity they are 56% more likely to die than normal people (Deminice et al, 2007). In a study by Marlowe, obesity was the most common cause of death in obese people compared to normal people with degenerative cardiovascular disease and kidney disease. Because obese people lack specific agility, there are four times as many deaths from obesity as car accidents, and four times more deaths from diabetes than normal people. Obesity problems are significant. 10 billion was invested in the food program industry in 1973, of which 14.9 million for weight control, 220 million for health and weight loss centers, 100 million for sports equipment, 54 million. Dollars have been spent on purchasing authorized weight control medicines and 1 million on dietary nutrients, and it is easy to guess how these numbers have grown exponentially in the 1980s and 1990s(Burgomaster et al, 2007). In order to clarify all the ambiguities raised, the researcher aims to answer the following questions: Does 8 weeks of high intensity and moderate intensity continuous training affect the troponin I levels of obese college students?

## 2. Research Method

The purpose of this study was to determine the response of 8 weeks of high intensity periodic and moderate intensity intermittent training on plasma levels of troponin I in obese male students. The statistical population included all obese male students (BMI>30) in Zahedan in 2018 with the age range of 19 to 26 years. All of them participated in the study by filling out a voluntary consent form. In the present study, the sample size was selected by purposeful sampling as a distribution of recall in Zahedan city and after research and research, a researcher-made questionnaire was distributed among the samples and samples. Finally, 45 patients were divided into 3 groups: high intensity intermittent exercise (15 N), moderate intensity continuous training (15 N) and control group (15 N). - TOYO TROPONIN I kit was used to determine and measure troponin I. After selecting the subjects purposefully, the samples were randomly divided into three groups of high intensity interval training, medium intensity continuous training group and control group. At first, information about height, age, weight, hereditary diseases and demographic characteristics were measured and the forms were completed by the subjects. Body composition index (BMI) of all three groups was measured by the following formula (Burgomaster et al, 2005): Each group performed according to the specified schedule during the training period. 24 hours before the start of the training program and 48 hours after the last blood sampling session. Performed by Zahedan Trust Laboratory experts, blood plasma was separated and analyzed for laboratory process. Trainings were performed in the first week, with 55% of maximal heart rate and 30 seconds with 2 repetitions. Subsequently, 5% of the maximum heart rate was given weekly and 30 seconds were added to the number of repetitions every two weeks. The intensity of rest in the first week was 30% of maximum heart rate and rest time of 1 minute and gradually 5% of maximum heart rate and 60 seconds of rest time per week until the end of the eighth week.

In the first session, the exercise started with 40% of the reserve heart rate and gradually with the progress of the subjects, 5% was added to the intensity of the training every week and after the subjects reached 60% of the heart rate reserve, this condition preserved until the end of the protocol. Descriptive

statistics such as mean and standard deviation were used to describe the research data, and to test the research hypotheses after assuring that the data were normalized using the Kolmogorov-Smirnov test, dependent t-test for within-group comparison and One Way ANOVA test. Tukey post hoc test was used to compare between groups and, if significant, to examine differences between groups. Statistical analysis was performed using SPSS 20 at the significant level  $P \leq 0.05$ .

### 3. Findings

Table 1 provides information on the descriptive statistics of the research groups.

**Table1.** Mean $\pm$ SD of the four groups' anthropometric indices

Due to the natural distribution of variables in the study groups, parametric t-test and one-way ANOVA were used to compare the groups.

Group Variable	Interval training M $\pm$ SD		Continues training M $\pm$ SD		Control M $\pm$ SD	
	Pre	Post	Pre	Post	Pre	Post
Age (Year)	21.80 $\pm$ 3.41		21.60 $\pm$ 2.42		21.40 $\pm$ 2.2	
Height(cm)	173.26 $\pm$ 49.4		172.53 $\pm$ 6.55		171.80 $\pm$ 8.06	
Weight(kg)	92.4 $\pm$ 10.18	89.4 $\pm$ 10.19	91.66 $\pm$ 11.81	88.4 $\pm$ 9.63	90.4 $\pm$ 14.25	92.68 $\pm$ 12.36
BMI (kg/m <sup>2</sup> )	30.1 $\pm$ 2.21	29.8 $\pm$ 2.19	30.01 $\pm$ 2.61	28.08 $\pm$ 2.21	30.8 $\pm$ 2.19	31.02 $\pm$ 2.61
WHR(cm)	0.87 $\pm$ 0.03	0.86 $\pm$ 0.04	0.83 $\pm$ 0.05	0.82 $\pm$ 0.03	0.86 $\pm$ 0.04	0.87 $\pm$ 0.05

The mean of height and weight as well as variable values of troponin I in all three groups were compared using one-way ANOVA to examine the differences between groups.

According to Table 1, the effect of 8 weeks of high intensity intermittent exercise on pre- and post-troponin I plasma levels in obese male students was significant. Paired t-test was used to test this hypothesis and the results are presented in Table 2.

**Table2.** Paired t-test results of plasma troponin I levels response to eight weeks of high intensity intermittent exercise compared with pre-exercise values

variable	group	Two sample differences		T	df	P
		mean	S.D			
Troponin I	Interval training	-0.019	0.006	10.946	14	0.001**

The results of statistical analysis showed that there was a significant difference between the mean scores before and after the training program of high intensity interval training in all three factors of troponin I ( $p < 0.05$ ). Therefore, the research hypothesis is confirmed. In other words, 8 weeks of high intensity intermittent exercise on pre- and post- troponin I plasma levels in obese male students was significant.

**Table3.** Paired t-test results of response to plasma troponin I levels to eight weeks of moderate-intensity continuous exercise compared with pre-exercise values

variable	group	Two sample differences		T	df	P
		mean	S.D			
Troponin I	Continues training	-0.020	0.004	-15.849	14	0.001**

On the other hand, statistical analysis of independent t-test showed that there was a significant difference in plasma levels of troponin I in obese students compared to the control group ( $P < 0.05$ ).

**Table4.** Independent t-test results of indices in high intensity periodic exercise group compared with control group

variable	difference mean	t	F	P
Troponin I(ng/mlit)	0.08 $\pm$ 0.12	2.76	14	0.02**

The results showed that moderate-intensity continuous training did not show a significant difference in troponin I levels ( $p = 0.25$ ) and F was not significant.

**Table5.** Independent t-test results of the indices in the moderate intensity continuous training group compared to the control group

variable	difference mean	t	F	P
Troponin I(ng/mlit)	0.004 $\pm$ 0.0037	1.175	1.99	0.25

The results of data analysis showed that intense intermittent training did not show a significant difference in the concentration of markers of cellular injury ( $P > 0.05$ ) in comparison with moderate to intense training, and F value was not significant in all three variables.

**Table6.** Independent t-test results of indices in high intensity periodic exercise group compared to moderate intensity exercise group.

variable	difference mean	t	F	P
Troponin I(ng/mlit)	0.002 $\pm$ 0.002	0.756	0.669	0.456

#### 4. Discussion

Paired t-test results, which were used to compare the changes of inflammatory markers in the present study, showed a significant difference between the study groups ( $P < 0.05$ ). The research hypothesis is therefore confirmed. That is, there was a significant difference between the 8 weeks of high intensity intermittent exercise on plasma levels of troponin I in obese students compared to pre-exercise. The findings are consistent with the findings of Heydari and Nielsen. On the other hand, the results of this finding are inconsistent with those of Campbell.

Bocchella conducted a study on the effect of increased intermittent aerobic exercise on muscle strength and body composition in patients with chronic heart failure, and found that muscle mass loss and muscle strength were a common problem among patients. Chronic heart failure (CHF) and endurance training are effective in improving their ability to exercise. In this study, 20 CHF patients were randomly divided into two groups of aerobic exercise ( $n = 10$ ) and combination of aerobic exercise and strength training ( $n = 10$ ). The aerobic group included aerobic interval training on the ergometer and the other group included strength training for different muscle groups including quadriceps, hamstrings, biceps muscles and deltoid muscles. The training time was equal in both groups. Body composition was measured by X-ray and quadriceps strength by testing two maximal repetitions for each leg. The results of this study showed that there was no significant change in lean mass between individuals and between groups ( $P < 0.05$ ). But the performance of both groups was improved in two maximal test ( $P < 0.05$ ). However, there was a significant difference between the groups ( $P < 0.05$ ) and it was reported that the combination of aerobic interval training and strength training alone had more beneficial effects on muscle strength in CHF patients (Creer et al, 2004). The results of this study are therefore inconsistent with the present study.

Paired t-test results, which were used to compare the changes of inflammatory markers in the present study, showed a significant difference between the study groups ( $P < 0.05$ ). Therefore, the second hypothesis of the study is confirmed. In other words, there was a significant difference between the effect of 8 weeks of moderate-intensity training on plasma levels of troponin I in obese students compared to pre-exercise.

The results are in line with those of Keithing, Nazari, Razmjo. In a study showed that there was a significant increase in creatine kinase and lactate dehydrogenase compared to intense periodic activity (Duffield et al, 2005). The findings were inconsistent with the findings of Williams in a study of 10 elite cyclists participating in a no-change troponin I test before, during, and two days after the race. In contrast, Jesal found in their study that an increase in cardiac injury indices, including troponin I, was correlated with increased endurance activity time (Bayati et al, 2011). A review of this study found that several studies have evaluated the effect of exercise time on various physiological and cardiovascular risk factors including platelets, lipoproteins, immunoglobulins, cortisol, and heart rate (Esfarjani & Laursen, 2007), but no research by the researcher. No effect of exercise time on troponin I was observed.

#### 5. Conclusion

Overall, research has shown that the relationship between exercise activity and cardiac injury index, including troponin I, is of great importance, and the subjects of current research are mainly young people or athletes. Also, most research has been on endurance runners, triathletes, and swimmers whose patterns of activity are consistent and consistent. In other words, evidence of cardiac troponin I release following prolonged endurance activity has been reported by a large number of researchers. However, when comparing the two methods, there is no significant difference in VO2 max increase, and it can be said that both training methods are suitable for improving and increasing VO2 max. On the other hand, there were no significant differences in body composition changes due to the type of exercise and both methods caused changes in body composition, but only in the aerobic training group, a significant difference was observed. It shows that the body composition of the subjects in the two stages of pre-test and post-test underwent significant changes.

Overall, it can be concluded that obesity is a complex reaction between genetic, physiological, socioeconomic, and cultural factors. Several environmental and genetic factors affect the incidence and severity of obesity (Hesari et al, 2014). The prevalence of obesity is increasing at an alarming rate in virtually all age groups and communities around the world. Obesity has become the most important preventable cause of disease and death. Obesity leads to significant morbidity and mortality from weight-loss and quality of life diseases. They cause hypertension, type 2 diabetes, depression, previous vascular diseases, and cancers (Mujika et al, 2002). Diet and exercise play an important role in weight loss, and success in one or both of these areas requires behavioral changes.

Regular exercise can be associated with appropriate physiological changes, leading to increased fat metabolism and weight loss. Therefore, considering the important role of cell injury indices in the body and the effect of exercise on these indices, it can be concluded that 8 weeks of high intensity and moderate intensity continuous exercise on the plasma levels of troponin I in obese male students is equally effective.

It should be noted that by examining the results of various researches, some in line with and some not in line with the results of the present study, it is clear that both methods of exercise have positive and significant effects on changes in body composition and improvement of aerobic capacity based on the characteristics of the subjects, such as subjects age, gender, physical health status, etc. You can benefit from a variety of aerobic exercises with varying intensity to improve the status quo.

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